J. F. DURYEA.

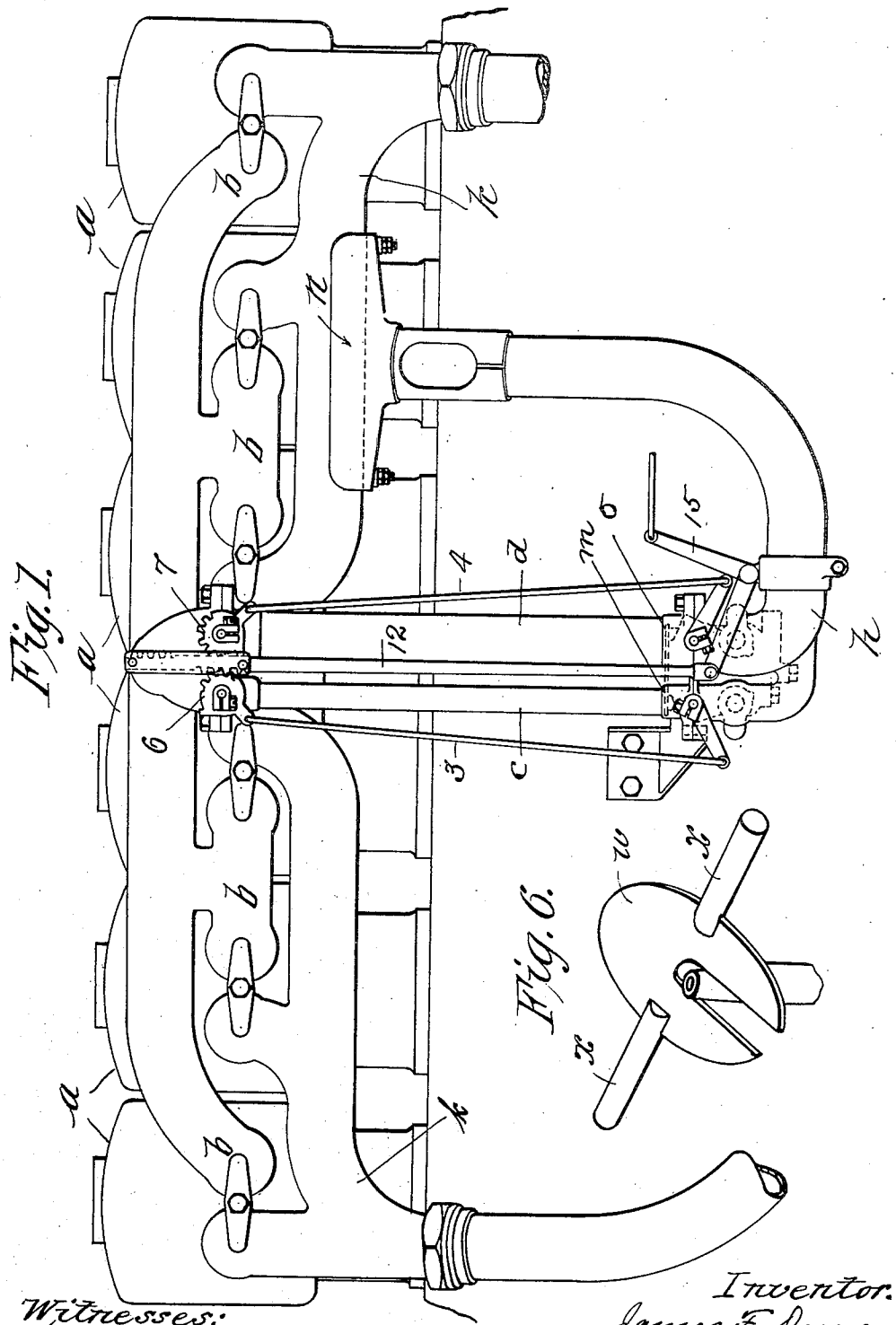
CARBURETER.

APPLICATION FILED JULY 15, 1907.

907,757.

Patented Dec. 29, 1908.

3 SHEETS—SHEET 1.



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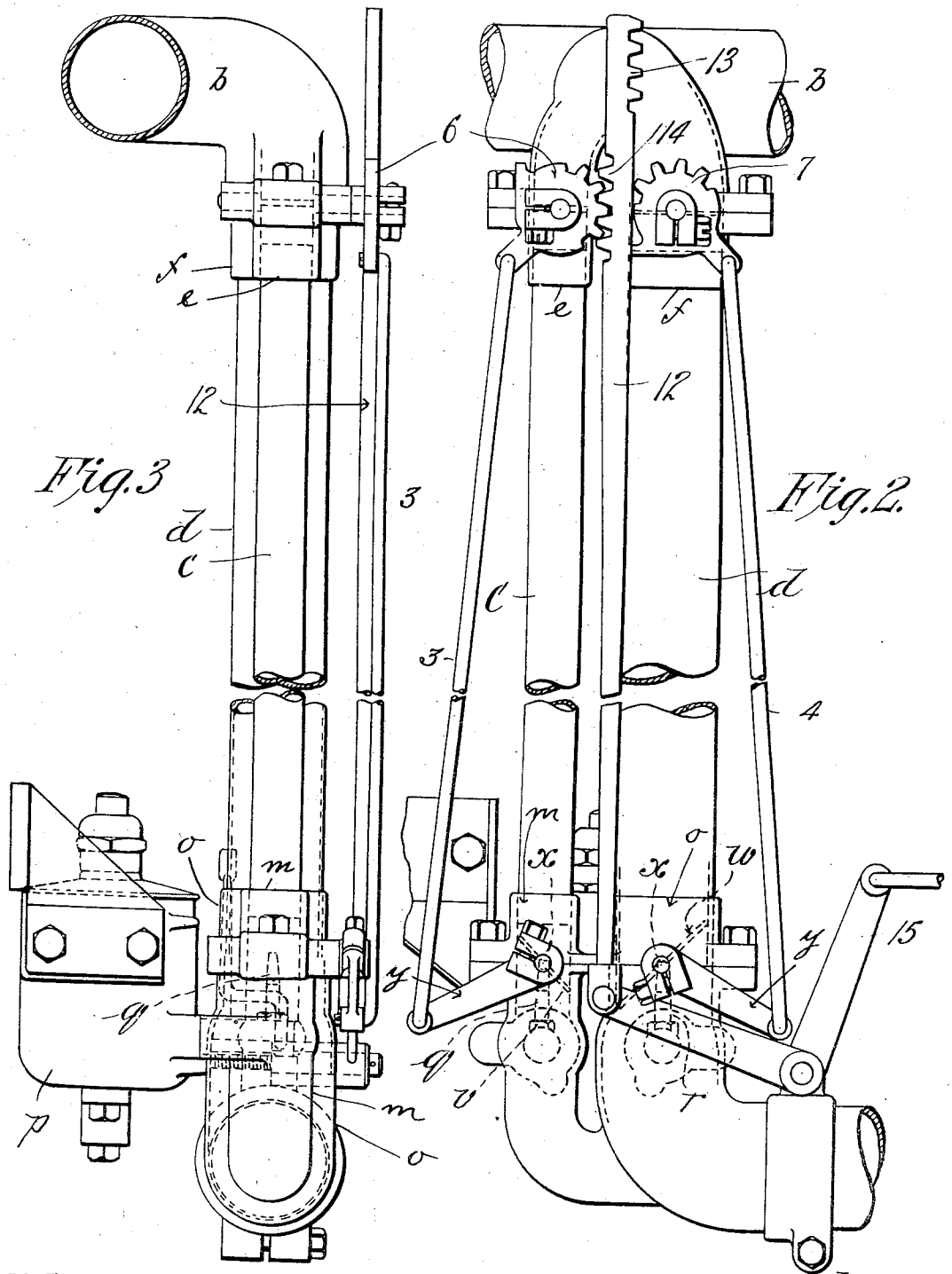


Fig. 3

Fig. 2.

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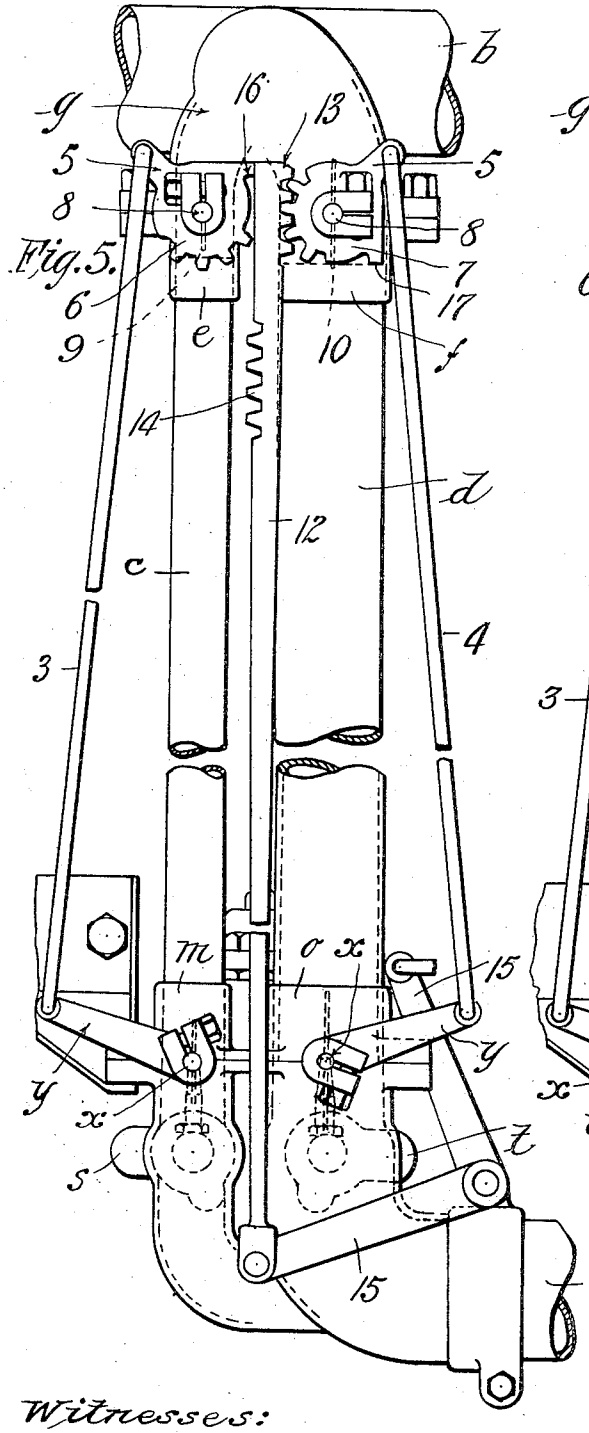


Fig. 5.

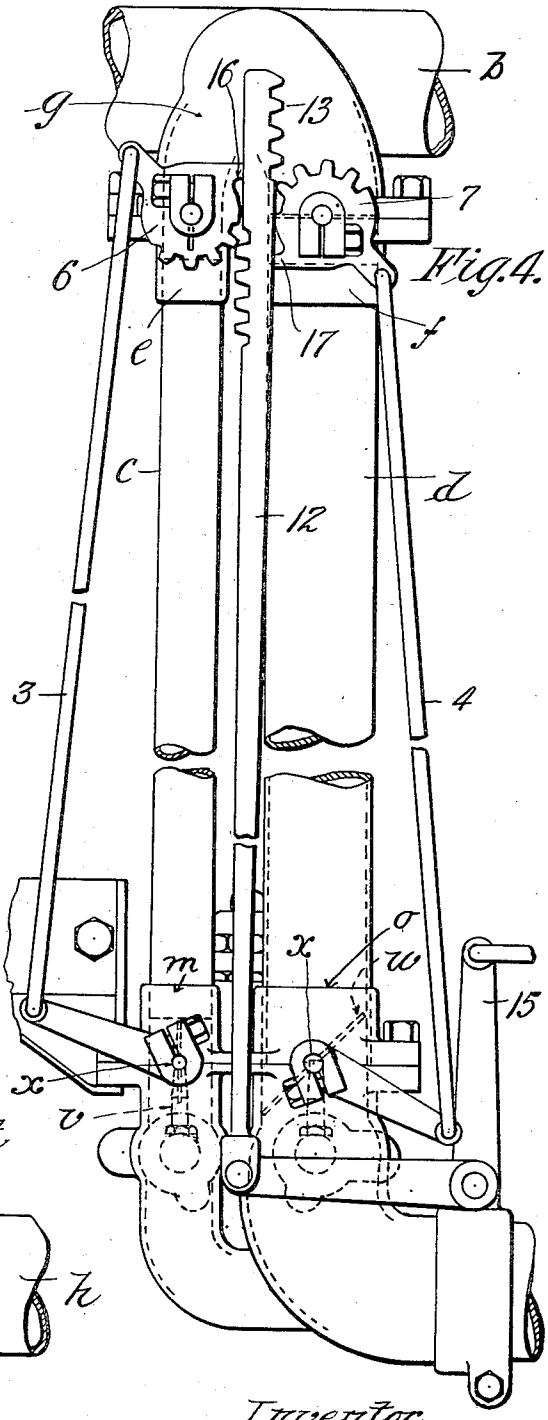


Fig. 4.

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UNITED STATES PATENT OFFICE.

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CARBURETER.

No. 907,757. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed July 15, 1907. Serial No. 383,771.

To all whom it may concern:

Be it known that I, JAMES FRANK DURYEA, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Carbureters, of which the following is a specification.

This invention relates to carbureters for internal combustion engines, the object thereof being to provide a device of this character whereby one carbureter is adapted to feed a number of cylinders whether the engine be running at a slow or a high speed; and to always maintain, whatever may be the speed of the engine, approximately the same proportion of air to the combustible element.

This device is designed particularly to operate in conjunction with that type of internal combustion engines in which atomized liquid hydrocarbon constitutes the combustible element when mixed with a suitable volume of air.

Difficulty has been experienced in supplying multiple cylinder engines of the type referred to with a uniform combustible mixture, at the two extremes of speed, for the reason that the pistons which act as pumps to draw the combustible through the carbureter, whereby it is atomized and mixed with air, vary so greatly in speed as to cause wide variation in the velocity of the air as it passes through the carbureter, thus varying the suction effect so greatly that at the two extremes of piston speed, the amount of combustible to a given volume of air will also be greatly varied, which variation, as is well known, results in variation of the working pressure in the cylinder, the disadvantage of which is too well known to call for any comment.

The present invention having in view the elimination of these disadvantages, consists in providing more than one conduit between the carbureter and inlet pipe leading to the ports of the cylinders, one conduit being of such capacity as to supply the combustible and air in correct proportion to the engine under all normal running conditions; a second conduit, preferably of greater cross sectional area, being also provided which, however, is normally closed, provision being made by means of valves in each conduit, whereby the first one may be gradually opened to its fullest capacity without opening the second, the valve in which begins to open only when the valve in the first is fully opened, the closing movements taking place in reverse order, all as will be fully described in the following specification, the construction in which the invention is embodied in its preferred form being illustrated in the accompanying drawings, in which,—

Figure 1 is a side elevation of a multiple cylinder engine to which the carbureter embodying this invention has been applied. Fig. 2 is a side elevation of the carbureter and its actuating devices shown on a larger scale than in Fig. 1, the position of the parts being that in which both of the valves in the conduits between the carbureter and the engine are closed. Fig. 3 is an elevation looking at the construction shown in Fig. 2 from the left, the position of the parts being the same. Fig. 4 is a view similar to Fig. 2 showing the position the parts occupy when the smaller of the two conduits is being used to its fullest capacity. Fig. 5 is a view similar to Figs. 2 and 4 showing the position the parts occupy when both of the conduits have been opened to their fullest capacity, that is when the engine is running at its highest speed. Fig. 6 is a perspective view of the preferred form of valve used in the conduits referred to, which shows also the upper end of the atomizing nozzle and its relation to the valve.

Referring now to these drawings, the cylinders of the engine, which are shown only in Fig. 1, are indicated by *a*, a six-cylinder engine being illustrated herein as it is in connection with a relatively large number of cylinders that the invention shows its greatest utility.

The inlet pipes for the cylinders are indicated by *b*, the conduits extending from the carbureter thereto being connected into these pipes about midway between their ends, which conduits are indicated respectively by *c* and *d*,—*c* indicating the smaller one. Connection is made between the conduits and the pipes *b* by a double T-connection whereby separate entrances for these conduits to the pipes *b* are provided at *e* and *f*; these, however, merging into a common chamber *g* from either side of which connection is made with the pipes *b*.

The air in-take is indicated by the pipe *h*, and in Fig. 1 of the drawing this has been

shown extended up to a point near the exhaust pipe *k* (see Fig. 1) where it terminates in a sort of a shell *m* lying close to the exhaust pipe, this being for the purpose of warming the air drawn into the pipe. This is a common practice and has nothing to do with this invention, it being sufficient for the purposes of the latter to consider the pipe *h* merely as an air in-take. That end of the in-take pipe to which the conduits *c* and *d* are connected is provided also with separate entrance connections for these conduits, (similar to *e* and *f*) which are lettered *m* and *o*, both of which entrances merge into the in-take pipe, as shown in the drawing.

Referring to Fig. 3, it is noted that the carbureter *p* is secured to the double-ended in-take pipe *h* in such position that it may supply the liquid combustible by gravity to the atomizing nozzle *q* in the conduit *c*, and *r* in the conduit *d*, and the preferred construction is to cast the in-take pipe *h* with its double end-entrances, and the pipe *b* also, and unite these two by means of the conduits *c* and *d*, suitable provision being made to secure the carbureter rigidly in place, the tubular bosses *s* and *t* being provided through which communication with the carbureter casing may be had on either side thereof near the bottom, the atomizing nozzles being screwed into a proper support bridging the parts *m* and *o*, so that they will be located axially within the parts and looking upwards. By means of this construction, upon each suction stroke of a piston, air will be drawn in through the pipe *h* and up through that one or both of the conduits *c* and *d* which is permitted to remain open, the rapid passage of air up past the atomizing nozzle serving in the well known manner to aspirate enough of the liquid hydrocarbon which issues from the nozzle in a fine spray, and mixing the same with the air on its way to the ports of the cylinders. The means provided whereby the conduit *c* alone may be used, and the conduit *d* cut off, or whereby both of these conduits may be used together,—the conduit *c* to its fullest capacity and the conduit *d* to its maximum capacity or less, as required,—are constructed as follows and comprise two valves, one in each of the conduits, that in the conduit *c* being indicated by *v* and that in the conduit *d* by *w*. These valves are preferably of the damper type, as shown in Fig. 6, and are secured to shafts *x* which extend transversely through both conduits. One end of each of the shafts *x* extends through the wall of the conduit in which they are respectively located far enough to permit a crank-arm *y* to be secured thereto in any convenient manner, that is there is a crank-arm *y* on each shaft, and from the outer end of each of the crank-arms connecting-rods 3 and 4 extend towards the upper end of the conduit where connection is made between them and an arm 5 on two broken gears 6 and 7, which are rotatably supported on shafts 8 extending through the parts *e* and *f* into which the conduits *c* and *d* are connected, and on these shafts are secured other valves 9 and 10 within the conduits and arranged to be actuated in unison with the valves *v* and *w* in the lower ends of the conduit, that is, the valves in each conduit open and close together.

It is by means of the broken gears 6 and 7 that the valves are operated as follows: Located between these gears is a vertically movable rod 12 having teeth 13 on one side thereof to mesh with the teeth of the broken gear 7, and other teeth 14 to mesh with the teeth of the gear 6, the teeth 14 being on the opposite side of the rod 12 to that on which the teeth 13 are located, and the position of the teeth on the gears is such that as the rod 12 is moved up and down by means of a crank-arm 15 supported on the in-take pipe *h*, the gear teeth 13 and 14 will engage their respective gears at different times,—one after the other. This is clearly shown in the drawings, Fig. 2 showing the position of the rod 12 when the valves in both conduits *c* and *d* are closed, the teeth 14 being shown in engagement with the gear 6, and the teeth 13 moved up above the gear 7.

Referring now to Fig. 4, the rod 12 is shown in the position it would occupy when the valves in the conduit *c* have been opened to their fullest extent, that is to say in a position parallel to the axis of said conduit, and this view shows that the teeth 14 on the rod are just passing out of engagement with the gear 6, the teeth 13 being about to engage with those of the gear 7.

Fig. 5 shows the rod still further down in the position it would occupy when the valves and conduit *d* have also been opened to their fullest extent, and it is clear that when the rod 12 is again moved up to the position shown in Fig. 2 the valves in the two conduits will be returned to their closed position in reverse order.

The crank-arm 15 may, by suitable connections as well understood, be actuated at a distance from the engine whereby the latter may be throttled down or opened up as desired from any convenient point.

In order to arrest the movement of the gears 6 and 7 each is provided with a stop,—that on the gear 6 being indicated by 16 and that on the gear 7 by 17, and these are respectively so located that when the gear 6, for example as shown in Fig. 4, has been rotated to that point at which the teeth 14 pass out of engagement therewith, the stop 16 prevents any further movement of said gear by the friction of the rod thereagainst which might rotate it far enough to prevent the proper meshing of the teeth 14 therewith,

and the rod 12 is moved upward again, the stop 17 on the gear 7 having a similar function.

From the foregoing description, it is clear that by means of the rod 12 the valves in the conduits *c* and *d* may be actuated as desired, whereby a greater or less area is provided through which the charge of combustible mixture for the cylinders may be aspirated on the suction stroke thereof, and from very slow to medium speed. The variation of the area of the passage through the conduit *c* past the valve therein is effected by the movement of the rod 12 under the control of the operator, this area being variable in either direction; and whenever the limit of this area is reached then only does a continuation of the valve opening movement bring into action those devices whereby the valve in the conduit *d* begins to open; and with the conduit *c* opened to its fullest extent, the area of the conduit *d* past the valve may be varied in either direction without change of the area of the conduit *c* until the valve in *d* has been fully closed.

What I claim, is:—

1. A carbureter comprising an inlet pipe communicating with the cylinder of an engine, an air in-take pipe, and a plurality of conduits extending between and having separate entrances into said pipes; an atomizing nozzle located axially in each conduit near the lower end thereof, together with a damper valve located in each of said conduits substantially in the plane of the upper end of the atomizing nozzles, and means to open and close said valves independently in succession.

2. The combination in a carbureter, of an inlet pipe communicating with the cylinder of an engine, an air in-take pipe, and a plurality of conduits extending between and communicating with said pipes, an atomizing nozzle located in each conduit, and a reservoir for a fluid combustible operatively connected with said atomizing nozzle, together with a pair of valves in each conduit, one valve in each end thereof, and means to open both valves constituting a pair in each conduit simultaneously, the pair of valves in each conduit being operable independently of the pair of valves in the other conduits and one pair after the other.

3. The combination with a carbureter, of an inlet-pipe communicating with the cylinder of an engine, an air in-take pipe, and a plurality of conduits extending between and communicating with said pipes, an atomizing nozzle located in each conduit, and a reservoir for a fluid combustible operatively connected with said atomizing nozzles, together with a pair of damper valves in each of said conduits, and means to connect said valves together consisting of crank-arms secured to the valves, means for connecting the crank-arms, and means connected to and actuated by a single member for operating the means connected to the crank-arms whereby the pair of damper-valves may be opened or closed independently of the other pair of valves, the second pair of said valves being inoperable until the opening movement of the first pair of valves has been completed.

4. The combination with a carbureter, of an inlet pipe communicating with the cylinder of an engine, an air in-take pipe, and a plurality of conduits extending between and communicating with said pipes, an atomizing nozzle located in each conduit, and a reservoir for a fluid combustible operatively connected with said atomizing nozzles, together with a pair of damper valves in each of said conduits, and means to open and close said pair of valves in each conduit independently and in succession of the pair of damper-valves in the other conduit, said means comprising a mutilated pinion on the axis of the damper-valves, a rack engaging the pinions whereby one pair of damper valves is rendered inoperative during the operation of the other pair, and means on the pinions for limiting the extent of rotation of the damper valves as described.

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